

GSM/GPRS Trainer board

USER MANUAL



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Version History

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Introduction:

TechshopBD's GSM/GPRS trainer board is based on SIMCOM's SIM900 Quad-Band GSM/GPRS module. This trainer board provides all facilities needed to interface the GSM/GPRS module with the serial port of any device like microcontroller or computer via serial port. By using this board you can perform sms, call and internet based communication with the help of AT commands for SIM900.

Powering up the board:

Green Connector: The 2-pin Green connector is for power supply. Connect the two terminals of the power supply to the green connector and place the power jumper. Then Hit the Power button.

As soon as you power up the board, the Green LED will start glowing and The Red one will start blinking fast.



Fig: Green Connector and Power LED and Netlight LED

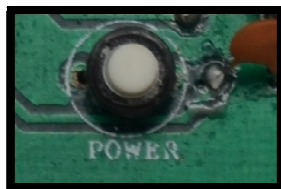
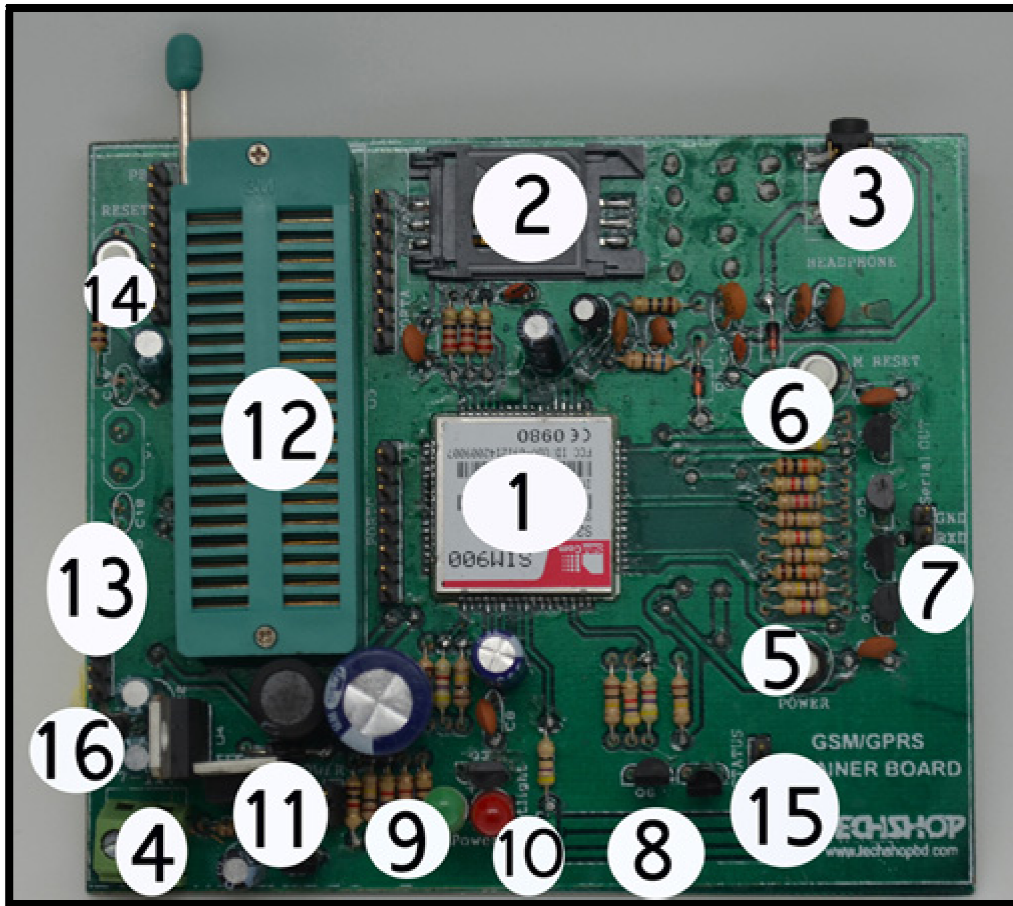


Fig: Power Button



Fig: Power LED glowing and Netlight LED Blinking

What's on Board?



- 1)SIM900 Module
- 2)SIM Socket
- 3)Audio Jack
- 4)Green Connector
- 5)Power button
- 6)Reset Button for SIM900 Module
- 7)Serial communication pins
- 8)Embedded Antenna
- 9)Power indicator LED
- 10)Network Indicator LED
- 11)Power Jumper
- 12)ZIF Socket
- 13)I/O Pins
- 14)Reset Button for Microcontroller
- 15)Status Out Pin
- 16)VCC and GND Pin

- 1) **SIM900 Module:** SIM900 is a quad- band GSM/GPRS module that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900 MHz. SIM900 features GPRS multi-slot class 10/ class 8(optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3, CS-4.



Fig: SIM900 Module

SIM900 has 68 STM pads and provides all hardware interfaces between the module and customers' boards.

- Serial PORT and debug PORT can help user easily develop user's application.
- Audio channel which includes a microphone input and a receiver input.
- Programmable general purpose input and output.
- The keypad and SPI display interfaces will give users the flexibility to develop customized applications.

SIM900 is designed with power saving technique so that the current consumption is as low as 1mA in sleep mode.

SIM900 integrates TCP/IP protocol and extended TCP/IP AT commands which are very useful for data transfer applications.

Table 1: SIM900 Key Features.

Feature	Implementation
Power supply	3.2V ~ 4.8V
Power saving	Typical power consumption in sleep mode is 1.0mA (BS-PA-MFRMS=9)
Frequency bands	● SIM900 Quad-band: GSM 850, EGSM 900, DCS 1800, PCS 1900. SIM900 can search the 4 frequency bands automatically. The frequency bands also can be set by AT command "AT+CBAND". For details, please refer to <i>document [1]</i>. ● Compliant to GSM Phase 2/2+
Transmitting power	● Class 4 (2W) at GSM 850 and EGSM 900 ● Class 1 (1W) at DCS 1800 and PCS 1900
GPRS connectivity	● GPRS multi-slot class 10 (default)
	● GPRS multi-slot class 8 (option)
Temperature range	● Normal operation: -30°C ~ +80°C ● Restricted operation: -40°C ~ -30°C and +80 °C ~ +85°C* ● Storage temperature -45°C ~ +90°C
Data GPRS	● GPRS data downlink transfer: max. 85.6 kbps ● GPRS data uplink transfer: max. 42.8 kbps ● Coding scheme: CS-1, CS-2, CS-3 and CS-4 ● Integrate the TCP/IP protocol. ● Support Packet Broadcast Control Channel (PBCCH)
CSD	● Support CSD transmission
USSD	● Unstructured Supplementary Services Data (USSD) support
SMS	● MT, MO, CB, Text and PDU mode ● SMS storage: SIM card
FAX	Group 3 Class 1
SIM interface	Support SIM card: 1.8V, 3V
External antenna	Antenna pad

Audio features	Speech codec modes: ● Half Rate (ETS 06.20) ● Full Rate (ETS 06.10) ● Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80) ● Adaptive multi rate (AMR) ● Echo Cancellation ● Noise Suppression
Serial port and debug port	Serial port: ● Full modem interface with status and control lines, unbalanced, asynchronous. ● 1200bps to 115200bps. ● Can be used for AT commands or data stream. ● Support RTS/CTS hardware handshake and software ON/OFF flow control. ● Multiplex ability according to GSM 07.10 Multiplexer Protocol. ● Autobauding supports baud rate from 1200 bps to 57600bps. Debug port: ● Null modem interface DBG_TXD and DBG_RXD. ● Can be used for debugging and upgrading firmware.
Phonebook management	Support phonebook types: SM, FD, LD, RC, ON, MC.
SIM application toolkit	GSM 11.14 Release 99
Real time clock	Support RTC
Physical characteristics	Size: 24*24*3mm Weight: 3.4g
Firmware upgrade	Firmware upgradeable by debug port.

SIM900 works at this temperature, but some radio frequency characteristics may deviate from GSM specification.

Table 2: Coding schemes and maximum net data rates over air interface.

Coding scheme	1 timeslot	2 timeslot	4 timeslot
CS-1	9.05kbps	18.1kbps	36.2kbps
CS-2	13.4kbps	26.8kbps	53.6kbps
CS-3	15.6kbps	31.2kbps	62.4kbps
CS-4	21.4kbps	42.8kbps	85.6kbps

Operating modes:

The table below summarizes the various operating modes of SIM900.

Table 3: Overview of operating mode.

Mode	Function	
Normal operation	GSM/GPRS SLEEP	Module will automatically go into sleep mode if the conditions of sleep mode are enabling and there is no on air and no hardware interrupt (such as GPIO interrupt or data on serial port). In this case, the current consumption of module will reduce to the minimal level. In sleep mode, the module can still receive paging message and SMS.
	GSM IDLE	Software is active. Module registered to the GSM network, and the module is ready to communicate.
	GSM TALK	Connection between two subscribers is in progress. In this case, the power consumption depends on network settings such as DTX off/on, FR/EFR/HR, hopping sequences, antenna.
	GPRS STANDBY	Module is ready for GPRS data transfer, but no data is currently sent or received. In this case, power consumption depends on network settings and GPRS configuration.
	GPRS DATA	There is GPRS data transfer (PPP or TCP or UDP) in progress. In this case, power consumption is related with network settings (e.g. power control level); uplink/downlink data rates and GPRS configuration (e.g. used multi-slot settings).
Power down	Normal power down by sending the AT command “AT+CPOWD=1” or using the PWRKEY. The power management unit shuts down the power supply for the baseband part of the module, and only the power supply for the RTC is remained. Software is not active. The serial port is not accessible. Power supply (connected to VBAT) remains applied.	
Minimum functionality mode	AT command “AT+CFUN” can be used to set the module to a minimum functionality mode without removing the power supply. In this mode, the RF part of the module will not work or the SIM card will not be accessible, or both RF part and SIM card will be closed, and the serial port is still accessible. The power consumption in this mode is lower than normal mode.	

SIM 900 Pin Diagram:

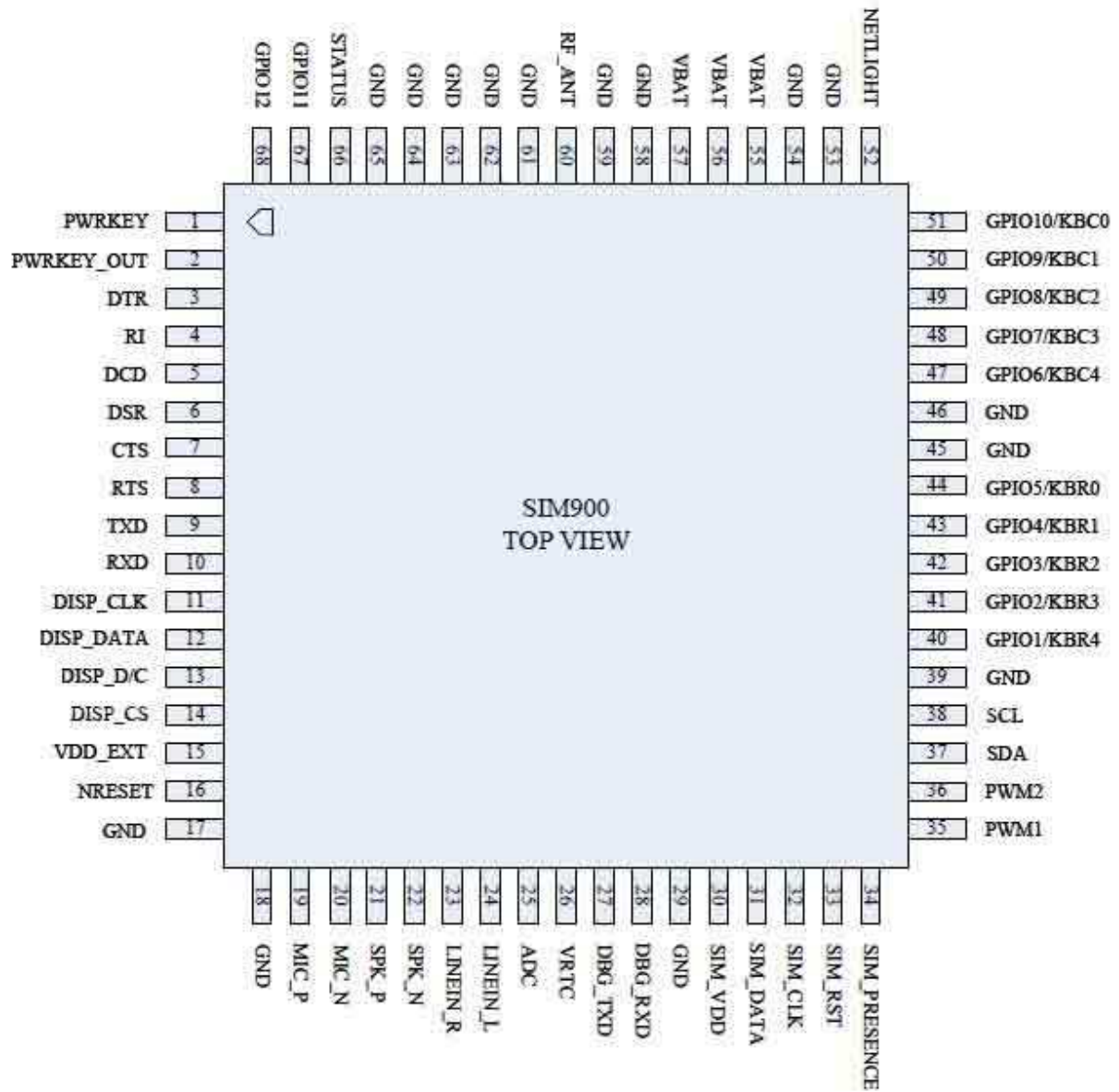


Table 4: Pin Description.

Pin name	Pin number	I/O	Description	Comment
Power supply				
VBAT	55,56,57	I	Power supply	
VRTC	26	I/O	Power supply for RTC	It is recommended to connect with a battery or a capacitor (e.g. 4.7uF).
VDD_EXT	15	O	2.8V output power supply	If it is unused, keep open.
GND	17,18,29,39,45,46,53,54,58,59,61,62,63,64,65		Ground	
Power on/down				
PWRKEY	1	I	PWRKEY should be pulled low at least 1 second and then released to power on/down the module.	Pulled up internally.
Audio interfaces				
MIC_P	19	I	Differential audio input	If these pins are unused, keep open.
MIC_N	20			
SPK_P	21	O	Differential audio output	
SPK_N	22			
LINEIN_R	23	I	Line-in input	
LINEIN_L	24			
Status				
STATUS	66	O	Power on status	If these pins are unused,

NETLIGHT	52	O	Network status	keep open.
LCD interface				
DISP_CLK	11	O	Display interface	If these pins are unused, keep open.
DISP_DATA	12	I/O		
DISP_D/C	13	O		
DISP_CS	14	O		
I ² C interface				
SDA	37	O	I ² C serial bus data	If these pins are unused, keep open.
SCL	38	I/O	I ² C serial bus clock	
Keypad interface / GPIOs				
GPIO5/KBR0	44	I/O	GPIO5/keypad row 0	If these pins are unused, keep open.
GPIO4/KBR1	43		GPIO4/keypad row 1	
GPIO3/KBR2	42		GPIO3/keypad row 2	
GPIO2/KBR3	41		GPIO2/keypad row 3	
Serial port				
RXD	10	I	Receive data	This pin should be pulled up to VDD_EXT externally.
TXD	9	O	Transmit data	If these pins are unused, keep open.
RTS	8	I	Request to send	
CTS	7	O	Clear to send	
DCD	5	O	Data carrier detect	
RI	4	O	Ring indicator	
DTR	3	I	Data terminal ready	
Debug interface				
DBG_TXD	27	O	For debugging and upgrading firmware	If these pins are unused, keep open.
DBG_RXD	28	I		

SIM interface				
SIM_VDD	30	O	Voltage supply for SIM card. Support 1.8V or 3V SIM card	All signals of SIM interface should be protected against ESD with a TVS diode array.
SIM_DATA	31	I/O	SIM data input/output	
SIM_CLK	32	O	SIM clock	
SIM_RST	33	O	SIM reset	
SIM_PRESENCE	34	I	SIM card detection	If it is unused, keep open.
ADC				
ADC	25	I	Input voltage range: 0V ~ 2.8V	If it is unused, keep open.
External reset				
NRESET	16	I	Reset input(Active low)	Recommend connecting a 100nF capacitor.
Pulse width modulation(PWM)				
PWM1	35	O	PWM	If these pins are unused, keep open.
PWM2	36	O	PWM	
RF interface				
RF_ANT	60	I/O	Radio antenna connection	Impedence must be controlled to 50Ω.
Not connect				
NC	2,6	-		These pins should be kept open.

To know more about this module please check this datasheet and see this AT command list for AT command set.

- 2) **SIM Connector:** A SIM connector is provided on Top of the board. Place your mobile SIM here and SIM900 will be registered to the network.

Note:As soon as it happens, the Red LED starts blinking slowly.



Fig:SIM card Holder

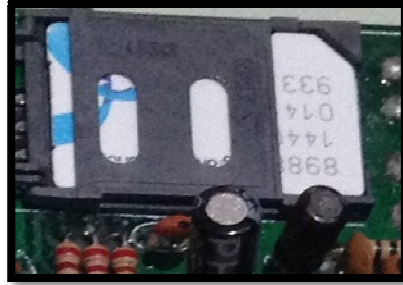


Fig: SIM Card Placement

- 3) **Audio Jack:** With the audio jack you can attach headphone and make talk while sending or receiving voice calls.

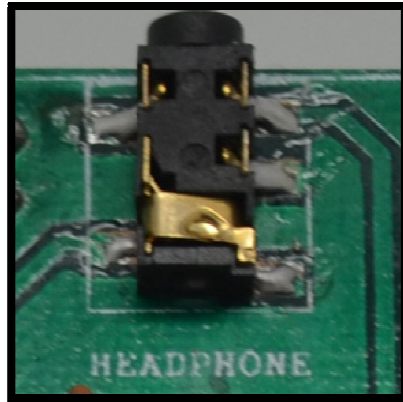


Fig: Audio Jack

Note: You have to use the headphones for mobile phone to use with this board. Computer compatible headphones will not work.

- 4) **Green-Connector:** The 2-pin Green connector is for power supply. Connect the two terminals of the power supply to the green connector.

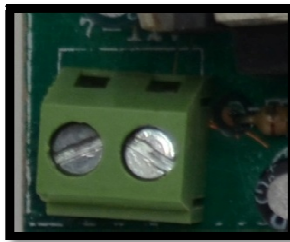


Fig: Green Connector

- 5) **Power Button:** If power button is pressed then the module is on. From microcontroller we can also power the module using PC0 (pin-22). If we send 1s pulse on PC0 pin then the module will also on. When it is on if we send 1s pulse again to PC0 the module will be turned off.

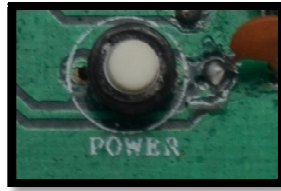


Fig: Power Button

- 6) **M_Reset Button:** When we press the button the module will be reset. We can also do this operation from microcontroller using PC1 (pin-23). If we send 1s pulse on PC1 pin then the module will reset.

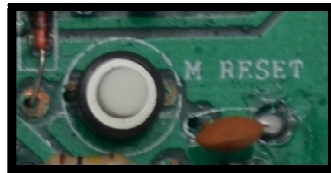


Fig: M-RST Button

- 7) **Serial communication Pin-out:** Serial communication pins lets the devices to be connected to Computers and microcontrollers via serial port. Serial port pins are also routed to Zif socket Compatible with ATmega16 or ATmega32.

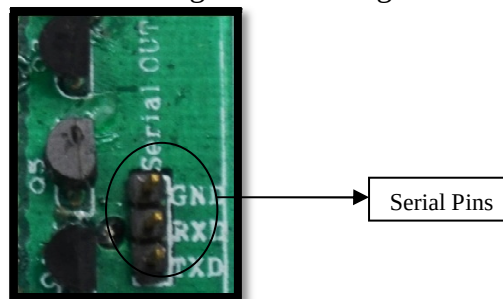


Fig:Serial Communication Pins

- 8) **Embedded Antenna:** No external antenna is needed.

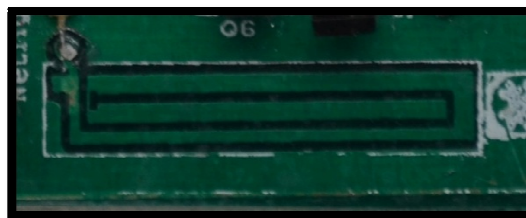


Fig: Embedded Antenna

- 9) **Power Indicator LED:** When is board is powered, a green led will be on.
 10) **Network Indicator LED:** A red led blinks indicating module network.
 11) **Power Jumper:** Manually to start the module regulator we can use jumper wire. Otherwise from microcontroller if we set the PD7(pin-21) high then the module regulator will also be on. So to turn on the module we must use jumper or set PD7 pin high.



Fig: Power jumper, Power & Network indicator LEDs

- 12) ZIF Socket:** SIM900 evaluation board features a ZIF socket which is compatible with ATmega16 and ATmega32. Once you place any Microcontroller of these two series that will be interfaced with the SIM900 Module.

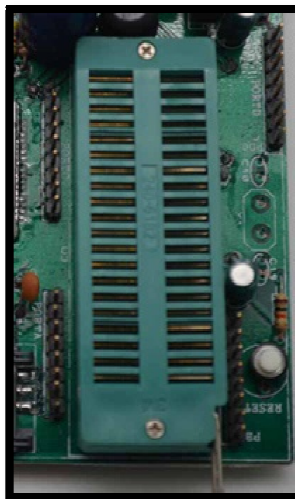


Fig:Zif Socket & I/O Pins & Reset Button

- 13) I/O Pin-out:** I/O Pins are provided in both sides of the ZIF socket. With the help of these Pin-outs, you can access all the pins of the AVR microcontroller placed on the ZIF socket.
- 14) Reset Button:** The Reset Button at the left corner of the board resets the microcontroller placed on the ZIF Socket.

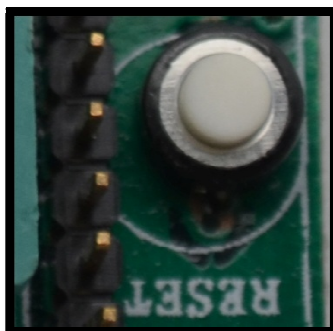


Fig:Reset Button

15) Status Out Pin: We can figure out the module status reading this pin. Moreover from microcontroller PC2(pin-24) indicates the status of the module. If the module's status is on then this pin becomes high and vice-versa.

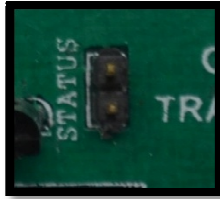


Fig:Status Out Pin

16) VCC and GND Pins: VCC and GND pins are provided in the board so that you can connect the board to any other external board or module.

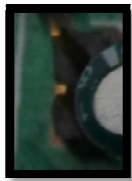


Fig:VCC & GND Pins

4)Connecting SIM900 evaluation board to your PC:

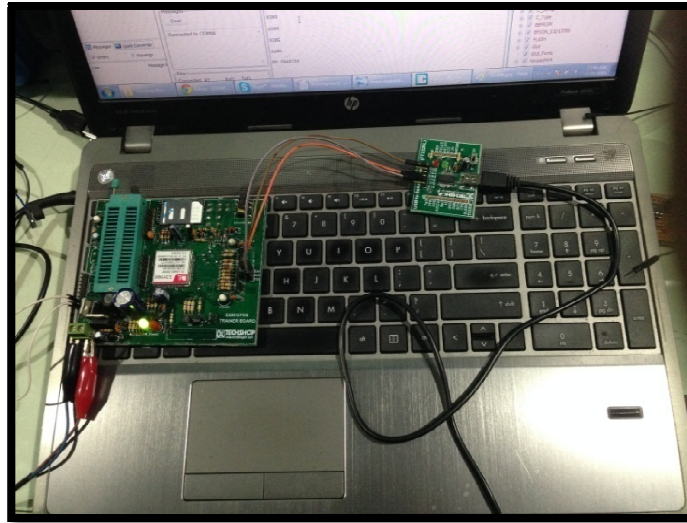
To interface SIM900 with your PC or laptop, you need an USB to serial converter.

Here we have used our [USB to Serial Converter \(FT232RL\)](#).

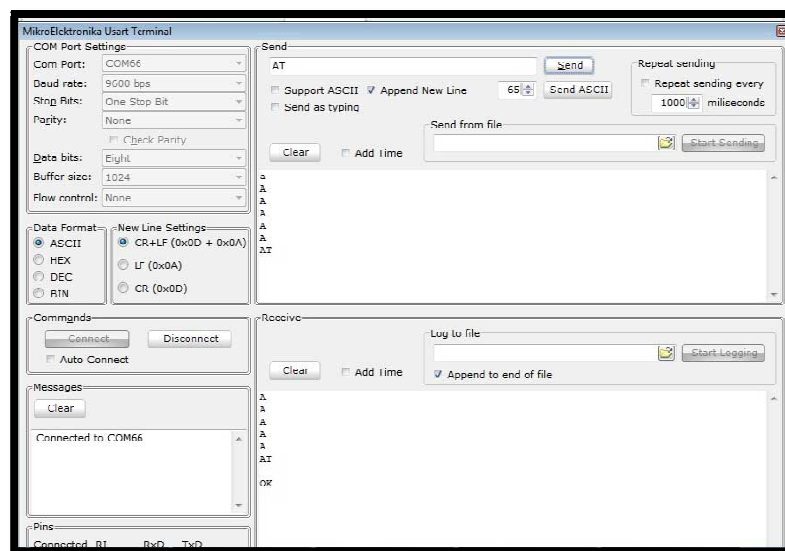
Step 1: Power up the evaluation board as mentioned above and Connect the following pins of the evaluation board and USB to serial converter together:

SIM900 Evaluation Board	USB to Serial Converter(FT323RL)
TX	RX
RX	TX
GND	GND

Step 2: Then connect the USB to Serial converter to your computer through an [USB A to Mini B Cable](#).



Step 3: Open the Serial monitor. Here we have shown the serial monitor of microC for AVR. By clicking on MicroC for AVR>Tools>USART Terminal. The following window will appear in that case.



Please check the [AT command set](#) of SIM900 modem.